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1.0 Purpose

The purpose of this procedure is to establish procedures for the proper use and maintenance of gas testing equipment (including gas test instruments, detector tubes, bag sampling kits, and personal monitors) to assure that instruments are used in accordance with the manufacturers' recommendations and the equipment is properly maintained to insure accurate test results.

2.0 Scope

This procedure will apply to all employees who use gas testing equipment.

3.0 Procedure

3.1 General Requirements

3.1.1 All gas tests will be made in accordance with established procedures.

3.1.2 All gas tests will be made only by personnel qualified to perform gas testing. Personnel qualified to perform gas testing will receive annual training, and will have read the operating instructions, have a working knowledge of, and operate each instrument in accordance with the manufacturers' operating instructions.

3.2 Gas Test Instruments

3.2.1 Approved gas testing instruments and applications are shown in Attachment 1.

3.2.2 Use

3.2.2.1 On any given shift, proper operation of each gas testing instrument will be verified before its initial use.

3.2.2.1.1 Instrument responsiveness to a flammable mixture will be checked using docking stations, and re-calibrated if needed. Calibration gas mixtures based on sensor configuration will be maintained in all control rooms for this purpose. See Table 1 for MX6 iBrid calibration gases. Results of this check will be recorded by the docking station. NOTE: Lighter fluid, butane, etc., must not be used for checking these instruments.

Table 1 – MX6 iBrid Calibration Gases

Sensor	Calibration Gas
LEL – Catalytic Bead	25% Pentane
C_3H_8/Inert – LEL Infrared (IR)	25% Propane (C_3H_8)
PID/VOC – Photoionization (PID) Sensors / Volatile Organic Compounds	100 ppm isobutylene (C_4H_8)
O_2 – Oxygen	18% O_2
CO – Carbon monoxide	100 ppm CO
H_2 – Hydrogen	100 ppm H_2
H_2S – Hydrogen sulfide	25 ppm H_2S
NH_3 – Ammonia	25 ppm NH_3
SO_2 – Sulfur dioxide	10 ppm SO_2

3.2.2.1.2 If the instrument fails the function test and re-calibration, then it

will be considered as defective and will not be used. See section V.D.2. for procedures on handling defective instruments.

3.2.2.1.3 The calibration and function test data will be transmitted electronically from the unit gas tester docking station to the database server.

3.2.2.1.4 The Safety Equipment Group will collect data from docking stations without a LAN connection or when LAN connection is lost.

3.2.2.2 Industrial Scientific MX6 iBrid must be used when sampling for hydrocarbons in areas containing inert atmospheres.

3.2.3 Storage

3.2.3.1 Each instrument will be numbered and assigned to a unit.

3.2.3.2 A designated storage area inside each control room or other protected area will be provided for each gas test instrument.

3.2.3.3 All instruments will be kept in designated storage areas when not in use.

3.2.4 Inspection and Maintenance

3.2.4.1 The user will make routine performance inspections and bump tests as described in the manufacturers' operating instructions.

3.2.4.2 Defective gas test instruments should be immediately returned to the Safety Equipment Group and exchanged for another instrument.

3.2.4.3 The Safety Equipment Group will keep spare gas test instruments to be used as replacements for any that have been taken out of service.

3.2.4.4 Any instrument that has been repaired by the Safety Equipment Group will be appropriately sealed to ensure the user that the instrument is in working order.

3.2.4.5 The IH Team must send their gas tester calibration records to the Environmental Department by fifth working day of the following month.

3.3 Drager Tubes

3.3.1 The Drager Tube is one of the primary instruments used at this site for testing of toxic gases and vapors.

3.3.2 Drager Pump Operation

3.3.2.1 The gas detector pump is a hand-operated bellows pump which delivers 100 milliliters with each stroke. The gas detector pump not only pulls in the gas sample, but carries out a specific volume measurement with each stroke. Therefore, in order to obtain an accurate measurement, it is imperative that the bellows be completely compressed with each stroke.

3.3.3 Use of Detector Tube

3.3.3.1 Select the appropriate tube for the contaminant to be measured. It is imperative that the instructions supplied with each specific type tube be followed.

3.3.3.2 Some tubes will cross-react with other chemicals (e.g., a non-specific Benzene 0.5/a Tube and non-specific Benzene 5/b Tube will react with other aromatics such as xylene and toluene), resulting in a false reading. Be aware of other chemicals in the sample area which may alter results.

3.3.3.3 The detector tube boxes have an expiration date on them and will not be used after this date.

3.3.3.4 Tubes may be discarded with regular trash. The broken tube ends should be covered prior to disposal to prevent injury.

3.3.3.5 Attachments 2 and 3 list tubes kept in Refinery warehouses, respectively.

3.4 Bag Sampling

3.4.1 Further evaluation through bag sampling may be necessary under the following conditions:

3.4.1.1 Confined Space Entry and Regulated Area Characterization - When benzene Drager tube readings indicate elevated levels of benzene, bag sampling may be performed to confirm the presence and concentration of benzene and to determine the appropriate level of respiratory protection.

3.4.1.2 Process Material Characterization - When the presence and level of a specific hydrocarbon in a process stream cannot be determined through routine process sampling or fixed analyzers, bag sampling may be performed. Before bag sampling is conducted, Operations will confirm with the Lab that the specific hydrocarbon of interest can be accurately sampled and analyzed using this method.

3.4.2 Sampling Parameters

3.4.2.1 Bag sampling for process stream characterization should be performed only when routine process sampling or fixed analyzers have failed to provide the necessary information.

3.4.2.2 Bag sampling will not identify every possible contaminant within a confined space or process stream. It can identify specific hydrocarbons and hydrogen sulfide when the appropriate analysis technique is requested and applied. Operations must contact the Lab to ensure that the correct analysis is used.

3.4.2.3 Bag sampling can only be used to sample “gaseous” process streams at less than 350 F.

3.4.2.4 Bag sampling of process streams should only occur under rare or special circumstances. Sample bombs must be incorporated where routine sampling of a process stream is required. Where bag sampling is deemed necessary, appropriate personal protective equipment will be selected based on assumed exposure to the process stream and donned before drawing the bag sample. If necessary, contact HESS for guidelines on PPE selection.

3.4.2.5 Bag sampling kits are available at the Main Warehouse Shift Desk (SAP # 90114949, Warehouse Location # 3E06C.)

3.5 Alternative Gas Testing Instruments

3.5.1 Alternative gas testing equipment (anything not listed in Attachments 1 - 3) must be approved for the specified application by the HESS Department. Designated personnel must be trained in calibration, use and maintenance of the equipment.

3.5.1.1 Calibration, use, and maintenance must be conducted in accordance with the manufacturer’s instruction, and documented and filed with Asset Coordinator.

3.6 Training

3.6.1 In order to be qualified to perform gas testing, an individual must successfully complete annual training and a field performance evaluation.

3.6.2 Training will be coordinated, documented and tracked by the Training Department.

3.6.3 The Training Department will maintain a list of personnel qualified to perform gas testing.

4.0 Definitions

None

5.0 References

None

6.0 Attachments

6.1 Attachment 1 -- Approved Gas Testing Instrument/Applications

6.2 Attachment 2 -- Drager Tube Applications

7.0 Revision History

Revision Number	Description of Change	Written by	Approved by	Revision Date	Effective Date
0	Original issue. New integrated site procedure replaces GBR-HESS-EQ-07 under MOC 58261.	C. T. Hart	V. J. Meeks	3/1/2019	3/1/2019
1	Updated gas testing equipment information for transition to MX6 under MOC 66772.	S. Lambert	E. R., Kaysen	2/23/2021	9/3/2021

Attachment 1: Approved Gas Testing Instrument/Applications

Instrument	Service	Application	Applications Limits
1. Teledyne Model	O_2 in Helium	Catalyst Burns	1% O_2, Max
2. UltraRae 3000	H/C and Benzene Concentration in air atmosphere.	Confined Space Entry and Area Monitoring.	0 to 0.5 ppm Benzene 0 to 100 ppm Total Hydrocarbons
3. Industrial Scientific MX6 iBrid	H/C and O_2 Concentration in air atmosphere C_3H_8/Inert H_2 in air CO and H2S in air atmosphere SO_2 in air VOC in air NH_3 in air	Confined Space Entry and Hot Work Permitting Area monitoring Area monitoring	10% L.E.L., Max 19.5 to 23.5% O_2, Min/Max 10 % C_3H_8/Inert 25 ppm CO 10 ppm H_2S. 2 ppm $SO_2$100 ppm VOC 2 ppm NH_3

Attachment 2: Drager Tube Applications

Tube	Symbol No.	Range	Exposure Limit	No. of Strokes	Color Change
Ammonia 5/a	677950222	5-70 ppm 50-700 ppm	25 ppm	10 1	Blue
Ammonia 0.5%/a	677950230	0.5-10 %	25 ppm	1 + 1 desorption stroke in clean air	Violet
Benzene 0.5/a	677950313	0.5-10 ppm	1 ppm	40 to 2	Pale Brown
Carbon Dioxide 100/a	677950263	100-3000 ppm	5000 ppm	10	Blue Violet
Carbon Dioxide 0.1%/a	677950255	0.1-1.2% 0.5-6%	5000 ppm	5 1	Blue Violet

Carbon Disulfide 3/a	677950412	3-95 ppm	1 ppm	15 to 1	Yellow Green
Carbon Monoxide 10/b	677950180	10-300 ppm 100-3000 ppm	25 ppm	10 1	Brownish Green
Chlorine 0.2/a	677950461	0.2-3 ppm	0.5 ppm	10	Yellow Orange
Hexane 100/a	677950453	50-1500 ppm 100-3000 ppm	50 ppm	11 6	Green Brown
Hydrocarbons 0.1%/b	677950438	0.5-1.3% Propane 0.1-0.8% Butane	1000 ppm for propane 1000 ppm for butane	15 to 7 15 to 3	Brown Gray
Hydrochloric Acid 50/a	677950352	50-500 ppm 500-5000 ppm	(c) 2 ppm	10 1	White
Hydrochloric Acid 1/a	677950354	1-10 ppm	(c) 2 ppm	10	Yellow
Hydrogen Fluoride 1.5/b	677950198	1.5-15 ppm	0.5 ppm	20	Pale Pink
Hydrogen Sulfide 0.5/a	677950408	0.5-15 ppm	10 ppm	10	Pale Brown
Hydrogen Sulfide 5/b	677950396	5-60 ppm	10 ppm	10	Brown
Hydrogen Sulfide 1/d	677950404	1-20 ppm 10-200 ppm	10 ppm	10 1	Brown
Hydrogen Sulfide 0.2%/A	677950406	0.2-7%	10 ppm	1 + 2 desorption strokes in clean air	Black

Attachment 2: Drager Tube Applications (continued)

Tube	Symbol No.	Range	Exposure Limit	No. of Strokes	Color Change
Natural Gas Test	677950420	Qualitative determination of natural gas 0.5% methane 0.05% ethane or propane	1000 ppm for propane 1000 ppm for methane 1000 ppm for ethane	2	Ranges from Brown Green to Gray Violet
Pentane 100/a	677950446	100-1500 ppm	600 ppm	5	Green Brown
Petroleum Hydrocarbons 100/a	677950339	100-2500 ppm	300 ppm	2	Brownish Green
Styrene 50/a	677950297	50-400 ppm	20 ppm	11 to 2	Yellow
Sulfur Dioxide 1/a	677950206	1-25 ppm	2 ppm	10	White
Sulfur Dioxide 20/a	677950214	20-200 ppm	2 ppm	10	White
Toluene 5/b	677950289	5-80 ppm 50-300 ppm	20 ppm	10 1	Pale Brown
Xylene 10/a	677950248	10-400 ppm	100 ppm	5	Reddish Brown

[1] PEL/TLV = average exposure allowed over an 8-hour period, 40 hour work week as established by the Occupational Safety and Health Administration (PEL = Permissible Exposure Limit) or American Conference of Governmental Industrial Hygienists (TLV = Threshold Limit Value). The lower of the two exposure limits are followed by MPC in most cases and shown in the table above.

[2] c = ceiling value, ppm = parts per million